LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, as reported by the media, May 19-23, 2014. Although reviewed for accuracy, the Lab is not responsible for the media's interpretations.

HPC wire

BLOWING IN THE WIND

Normally invisible, wind wakes take shape in the clouds behind the Horns Rev offshore wind farm west of Denmark. ***Photo courtesy of Vattenfall.***

Though wind power has many positive attributes, its main downside is its sporadic nature. In fact, actual power production is correlated with a range of atmospheric variables, such as wind speed and turbulence, as well as spatial and temporal scales.

Research teams are working hard to reduce the uncertainty that affects wind power forecasts. One of the main sites dedicated to optimizing wind power in the United States is Lawrence Livermore National Laboratory. The Lab has about a dozen atmospheric scientists, mechanical and computational engineers and statisticians using fieldwork, advanced simulation and statistical analysis to boost wind power production. High-performance computing is integral to the effort.

With precision models like the ones LLNL and its partners are developing, wind farm developers and operators have the information they need to select ideal wind farm locations and run the sites more efficiently.

To read more, go to *HPCwire*.

PRiSM
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RECYCLING CO2

The Krafla geothermal power plant in Iceland. Lawrence Livermore researchers are developing a new geothermal power plant that will lock away carbon dioxide. ***Image courtesy of Ásgeir Egger.***

Controlling greenhouse gas emissions -- particularly carbon dioxide -- is essential to slowing the pace of climate change and the extreme weather and rising seas that come with it.

An extraordinary amount of heat seethes below Earth's surface, as erupting volcanoes demonstrate. Geothermal energy seeks to mine this heat to generate power.

Until recently, geothermal energy was considered to be of limited use geographically because the best reservoirs are located in volcanically or seismically active places such as the Western United States, where hot rocks are closer to the surface, requiring less drilling and lowering costs.

But Thomas Buscheck, leader of the geochemical, hydrological and environmental sciences group at Lawrence Livermore, and other LLNL researchers along with collaborators at Ohio State University and the University of Minnesota, have found that carbon dioxide could help expand the reach of geothermal energy in the United States to include most states west of the Mississippi River.

To read more, go to *Prism Magazine*.

Moyers & company

THE FACTS BEHIND CLIMATE CHANGE

Benjamin Santer, who was awarded a MacArthur Fellowship for research supporting the finding that human activity contributes to global warming, is a climate researcher at Lawrence Livermore.

Ever since scientists first began to explain the evidence that climate was warming -- and that human activities were probably to blame -- people have been questioning the data, doubting the evidence and attacking the scientists who collect and explain it. And no one has been more attacked than Lawrence Livermore's Benjamin Santer.

In 1995, the Intergovernmental Panel on Climate Change (IPCC) declared that the human impact on climate was now "discernible." This wasn't just a few individuals; by 1995 the IPCC had grown to include several hundred climate scientists from around the world. A chapter in an IPCC report summarized the evidence that global warming really was caused by greenhouse gases. The author: Ben Santer.

Santer had impeccable scientific credentials, and he had never before been involved in even the suggestion of impropriety of any kind, but a group of physicists accused him of doctoring the report to make the science seem firmer than it really was.

Santer spent enormous amounts of time and energy defending his scientific reputation and integrity.

To read more, go to *Bill Moyers*.

LLNL researchers and international collaborators have refined estimates of the orbit and size of the exoplanet Beta Pictoris b.

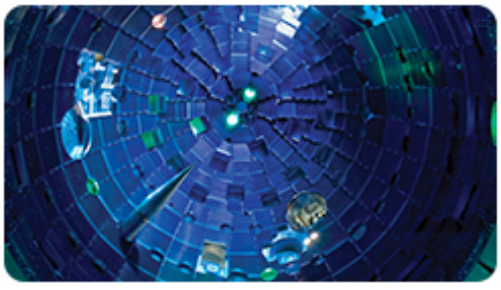
Using one of the world's largest telescopes, a Lawrence Livermore team and international collaborators have tracked the orbit of a planet at least four times the size of Jupiter.

The scientists were able to identify the orbit of the exoplanet, Beta Pictoris b, which sits 63 light years from our solar system, by using the Gemini Planet Imager's next-generation, high-contrast adaptive optics system.

The Gemini Planet Imager snapped an amazingly clear and bright image of the gas giant after an exposure of just one minute.

To read more, go to the *The Christian Science Monitor*.

SCIENTIFIC AMERICAN™ **ENERGY BREAKTHROUGH**



This view from the bottom of the target chamber shows the target positioner being inserted. Pulses from NIF's high-powered lasers race toward the Target Bay at the speed of light.

In a first-of-its-kind experiment at Lawrence Livermore's National Ignition Facility, the reaction exceeded the amount of energy deposited into the fuel.

Last September, under X-ray assault, the rapid implosion of a plastic shell into icy isotopes of hydrogen produced fusion at NIF. This wasn't just a run-of-the-mill fusion reaction; it was the first one NIF has ever produced wherein the fuel released more energy than it absorbed.

The Laboratory's 192 lasers have been pumping energy into a succession of tiny fuel pellets since 2010. In this instance, the scientists got the timing right. Instead of ramping up the lasers over the course of the blast, which lasts 20 trillionths of a second, Livermore physicist Omar Hurricane and his team started the blast at maximum intensity and then let it taper off. That change made the fuel in the two-millimeter pellet hotter sooner -- reaching temperatures of about 50 million degrees Celsius and pressures of 150 billion Earth atmospheres. Such conditions enable fusion, and, in this case, the fusing fuel yielded nearly twice as much energy as the roughly 10,000 joules that triggered it.

To read more, go to *Scientific American*.
